

WHAT IS CLAIMED IS:

1. For an electrically programmable non-volatile multi-level memory device including a plurality of non-volatile multi-level memory cells, each of the multi-level memory cells having a non-volatile memory storage portion for determining electrically alterable voltage threshold values, electrons being capable of being injected into the non-volatile memory storage portion, a method of operating the electrically alterable non-volatile multi-level memory device, comprising:

settling a status of at least one non-volatile multi-level memory cell of the plurality of non-volatile multi-level memory cells to one state selected from a plurality of states including at least a first level state, a second level state, a third level state and a fourth level state in response to information to be stored in the one non-volatile multi-level memory cell, and

reading the status of the one non-volatile multi-level memory cell to determine whether the read out status corresponds to one of the first level state, the second level state, the third level state and the fourth level state by utilizing a first reference level which is set between the second level state and the third level state, a second reference level which is set between the first level state and the second level state and a third reference level which is set between the third level state and the fourth level state,

wherein an operation of reading status of the one non-volatile multi-level memory cell, comprises:

comparing the status read out from the one non-volatile multi-level memory cell with the first reference level to discriminate whether the status corresponds to a

first group of the first and second level states or a second group of the third and fourth level states,

if a result of comparing the status indicates that the status corresponds to the first group, further comparing the status read out from the one non-volatile multi-level memory cell with the second reference level to discriminate whether the status corresponds to the first level state or second level states, and

if a result of comparing the status indicates that the status corresponds to the second group, further comparing the status read out from the one non-volatile multi-level memory cell with the third reference level to discriminate whether the status corresponds to the third level state or fourth level states.

2. The method of operating the electrically alterable non-volatile multi-level memory according to claim 1,

wherein a final result of comparing the status read out from the one non-volatile multi-level memory cell is representative of at least two-bit data.

3. For an electrically programmable non-volatile multi-level memory device including a plurality of non-volatile multi-level memory cells, each of the multi-level memory cells having a non-volatile memory storage portion for determining electrically alterable voltage threshold values, electrons being capable of being injected into the non-volatile memory storage portion, a method of operating the electrically alterable non-volatile multi-level memory device, comprising:

controlling a status of at least one of the non-volatile multi-level memory cells to determine whether the read out status corresponds to one of the first level state,

the second level state, the third level state and the fourth level state by utilizing a first reference level which is set between the second level state and the third level state, a second reference level which is set between the first level state and the second level state and a third reference level which is set between the third level state and the fourth level state,

wherein an operation of reading status of the one non-volatile multi-level memory cell, comprises:

comparing the status read out from the one non-volatile multi-level memory cell with the first reference level to discriminate whether the status corresponds to a first group of the first and second level states or a second group of the third and fourth level states,

if a result of comparing the status indicates that the status corresponds to the first group, further comparing the status read out from the one non-volatile multi-level memory cell with the second reference level to discriminate whether the status corresponds to the first level state or second level states, and

if a result of comparing the status indicates that the status corresponds to the second group, further comparing the status read out from the one non-volatile multi-level memory cell with the third reference level to discriminate whether the status corresponds to the third level state or fourth level states.

4. The method of operating the electrically alterable non-volatile multi-level memory according to claim 3,

wherein a final result of comparing the status read out from the one non-volatile multi-level memory cell is representative of at least two bit-data.